great museums which also have as a rule several smaller lecture halls. As many as seven or eight lectures may be held in such a museum in one week, as for instance one for the scientist, three in the afternoons for school children, two in the evenings for the general public, and other lectures for certain special classes of people, as for instance those interested in breeding or sanitation.

All the educational work of the museum exhibits is not confined to the inside of a great museum. Special cases of specimens are prepared and sent out to schools, libraries and other suitable places. Sometimes these are loaned indefinitely but very often they are loaned for a week and then moved to another place. In New York this feature of the work became so extensive that an automobile was purchased to transport the collections from the museum to the schools and from school to school, so that thousands of children were reached. This sort of work is somewhat akin to the work of branch banks and traveling libraries.

Many of our people do not appreciate the real use of a museum and we do not wonder at it when we see the dusty, poorly arranged collections in many museums where there are few, if any, labels and the whole tends to disgust, in fact to teach disorder rather than to be pleasing, helpful or educative, but in an up-to-date museum every day you may see classes from kindergartens enthusiastically examining specimens under the guidance of a museum kindergartner. Frequently one may see classes of bright high-school or college students on a visit to the museum halls, supplementing their educational work by viewing the actual things of which they study. They may be guided by a curator. Thousands of slum children in the greater cities are cheered, educated and uplifted by being taken to the museums by their teachers. One time when a lecture was advertised for school children by an enterprising newspaper which offered a prize for the best essay on a certain subject, over seven thousand children endeavored to attend the lecture held in a hall seating only one thousand four hundred, but one of the museum authorities sprang to his telephone and in as many minutes had twelve of the staff taking as many groups of the children to various parts of the building where they were entertained and instructed.

A great educational museum is usually open free to the public every day in the year so that people engaged on certain days may have the greatest possible opportunity to visit it for recreation, education or research. On the occasion of an exhibit for the prevention and cure of tuberculosis, in one museum over forty thousand visitors passed between the police lines in and out of the exhibit in a single day, which proved conclusively that the public is thoroughly alive to the importance and value of the most modern and useful museum work.

Harlan I. Smith
Geological Survey of Canada

THE PROFESSIONAL WORK OF PROFESSOR MORRIS LOEB[1]

Morris Loeb was a man in speaking of whom I wish I might have had time to choose my words with more deliberation. His nature showed itself always in such a refinement as to command its tracing only with the most delicate touch. Tender is the wound in losing a friend in science whom I had known for nearly twenty years,—in fact, since the time he was the secretary of the Section of Chemistry of the American Association at the Brooklyn meeting. At that time he was participating in the great task of habilitating the American Chemical Society, with the history of which no doubt all here are familiar.

I wish I were able to fittingly tell you of the spirit actuating him at that time, as it proved an inspiration to me then, and afterwards served to cement a friendship into a closer personal relationship.

Born and reared in wealth, a great plan in the business world ready for his acceptance, while gaining a broad culture at Harvard, he inhaled the breath of Wolcott Gibbs's scien-

[1] Presented at the October meeting of the New York Section of the American Chemical Society.

tific spirit, which carried him to Hofmann at Berlin. Three papers were published by him while at Berlin, the last being his dissertation.[2] All dealt with carbonyl chloride and its conduct with various amidines. This work was interesting and possessed that normal importance to the candidate for a degree; but Loeb was not satisfied. That was in 1887. The roving ardor of an awakening of physical chemistry was in the air. It carried him to Heidelberg and then to Leipzig to be with Ostwald, who had just made Arrhenius a real power.

By the advice of Ostwald, Loeb undertook to study the molecular weight of iodine in its solutions by the vapor-tension method.[3] His experimental results led him to conclude:

It seems very probable that iodine in its red solutions has a molecular weight corresponding to I_4, whilst in the violet solution in carbon disulphide there is a less complex aggregation, giving a value between I_2 and I_3.

He found that the method of determining molecular weights by the depression of the freezing-point is preferable to the method by vapor-tensions. He lacked a liquid which would solidify and also dissolve iodine with a pure violet color; but he endeavored to obtain what corroborative evidence he could by experimenting on the freezing-points of iodine in acetic acid and in benzene, although he was eventually forced to give up the attempt by the very slight solubility of iodine in these menstrua at low temperatures. The molecular weight of iodine as calculated from various series of observations seemed to increase continuously with the concentration, so that there was no point in the narrow limits between extreme dilution and saturation at which the molecular weight would appear constant and could be accepted as trustworthy. This was later confirmed by Paterno and Nasini.[4]

With the intention of testing the then latest views on electrolysis, work in which field he had begun with Gibbs, while still at Leipzig, Loeb, with Nernst, carried on a study of the kinetics of substances in solution.[5] From determinations of Hittorf's ratios of transference and the conductivity of a number of silver salts, they calculated the ionic velocity of silver, according to the principles laid down by Kohlrausch. The constancy of the value obtained from observations with eight different salts gave satisfactory evidence for the truth of the theory, the numbers varying only within very narrow limits. Loeb and Nernst also gave the calculated values for the velocities of the other ions, and it further appeared from a comparison with the temperature coefficients of the velocities that they decrease as the velocity increases.[6]

Loeb then felt ready to come back to the master who had changed his course in life and to tell him what they were doing in Europe. So in 1888–9 he returned as voluntary assistant to Gibbs, who had retired from Cambridge to his private laboratory at Newport. After a year, Gibbs realized Loeb's power as a teacher and made him go to Clark University as docent in chemistry.

In a report on "Osmotic Pressure and the Determination of Molecular Weights,"[7] Loeb discussed Raoult's law, the matured papers of van't Hoff on osmotic pressure, the measurement of osmotic pressure, and the methods of determining the molecular weight from the

[2] These papers were: "Ueber die Einwirkung von Phosgen auf Aethenyldiphenyldiamin," *Ber.*, 18, 2427 (1885); "Ueber Amidinderivate," *Ibid.*, 19, 2340 (1886); "Das Phosgen und seine Abkömmlinge, nebst einigen Beiträgen zu deren Kenntnis," Inaug. Dissert., 15 März I. Chem. Labor. d. Berlin Univers.; *Chem. Centr.*, 58, 635 (1887).

[3] "Ueber den Molekularzustand des gelösten Jods," *Z. physikal. Chem.*, 2, 606; "The Molecular Weight of Iodine in Its Solutions," *Trans. Chem. Soc.*, 53, 805.

[4] *Ber.*, 21, 2153.

[5] "Zur Kinetik der in Lösung befindlichen Körper. Zweite Abhandlung. Ueberführungszahlen und Leitvermögen einiger Silbersalze von Morris Loeb und W. Nernst," *Z. physikal. Chem.*, 2, 948.

[6] Loeb also published in this year a paper on the "Use of Aniline as an Absorbent of Cyanogen in Gas Analysis," *Trans. Chem. Soc.*, 53, 812 (1888).

[7] *Am. Chem. Jour.*, 12, 130–5.

vapor-tension. At this time (1890) experimental data to show the value of Beckmann's method had not been published, but Loeb predicted that it would play as great a part as the freezing-point method introduced in its most convenient form by the same chemist.

Shortly afterwards, in a review, Loeb sketched Arrhenius's hypothesis, with some of its logical consequences.[8] He discussed the physical and chemical objections known in 1890, leaving "the task of judging it . . . to those readers who will compare the mass of experimental material and will convince themselves of the simple relations which the various phenomena appear to bear toward each other. As far as this test is concerned," Loeb maintained, "the hypothesis will be found to fulfill its purposes."

In the exact measurement of electric currents, employing the method wherein the determination of the amount of silver deposited from a neutral solution of a silver salt is made, the source of error, particularly where weak currents are concerned, arises from the imperfect adhesion of the silver upon the cathode. The latter is generally a platinum crucible, and Loeb[9] found that a Gooch crucible with asbestos felting over the holes, was a far better form of cathode, providing an arrangement was adopted to hold the solution during electrolysis without leaking. He attained this very satisfactorily by replacing the ordinary platinum cap with a glass siphon of special form.

Then, when but twenty-eight years of age, he was called to the chair of chemistry at New York University. He published a paper entitled "Apparatus for the Delineation of Curved Surfaces, in Illustration of the Properties of Gases, etc."[10]

Professor Loeb thought that, just as an electric system is affected by its approach to or removal from a magnetic field, a reaction which made a system more or less amenable to magnetic action, might show evidence of acceleration or retardation by the magnetic force. He concluded that if this effect were appreciable, the relation between magnetic force and affinity would be established, and data could be obtained for calculating the real value of magnetization. His experimental results, however, were negative, and he was led to believe that no such relation existed, unless it was so slight that his means of observation were inadequate.[11]

It was shortly after this that I met Morris Loeb. He was fired with the zeal of those captain teachers, and his own lighted torch he passed on by students of his who now reflect, in many responsible positions, that spirit of the eighties.

Soon the very heavy responsibilities of a large inheritance fell upon him. Filial duty of meeting those responsibilities, professorial obligations, and research aspirations required the sacrifice of one of the three. The last was sacrificed for a dozen years. The irksome strain of being "by bells directed" began to tell, for to meet them he found it necessary to have his secretary travel with him to take his dictation. One morning he asked me to go with him to the university. We talked things over and he said he would have to give up the professorship, but he would equip a private laboratory in the old Chemists Club, where he would be nearer his philanthropic obligations and might do some research, and *"other things"* perhaps as useful to chemistry as teaching.

In 1905 he published a research on "The Crystallization of Sodium Iodide from Alcohols."[12] He found that apparently the molecular proportion of alcohol assimilated by sodium iodide decreases as the series ascends. The addition products determined were: $NaI \cdot 3CH_4O$; $NaI \cdot C_2H_6O$, and $5NaI \cdot 3C_3H_8O$.

In 1908, ever keeping abreast with the advances in physical chemistry, in a paper on the "Hypothesis of Radiant Matter,"[13] Loeb

[8] "The Electrolytic Dissociation Hypothesis of Svante Arrhenius," *Am. Chem. Jour.*, 12, 506–516.

[9] "The Use of the Gooch Crucible as a Silver Voltameter," *Jour. Am. Chem. Soc.*, 12, 300.

[10] *Jour. Am. Chem. Soc.*, 13, 263.

[11] "Is Chemical Action Affected by Magnetism?" *Am. Chem. Jour.*, 13, 145–153.

[12] *Jour. Am. Chem. Soc.*, 27, 1019.

[13] *Pop. Sci. Monthly*, 73, 52–60.

enumerated the objections which might be urged against the views which then obtained respecting radio-active processes.

In 1909 he assumed the duties of Chairman of our Section. The task of maintaining the high standard of the meetings set by his predecessor was no mean one, for Baekeland, with his customary enthusiasm, had raised the New York Section to its greatest efficiency. Loeb devoted himself to the welfare of the Section with unremitting energy. I am keenly appreciative of what he did for the Section, as it fell to my lot to take up the task where he left it. The opportunities of the office were increased, for he had enlarged the responsibilities, as well shown in his inaugural address that year.[14]

He did publish (1910) a paper on the "Analysis of Some Bolivian Bronzes" (with S. R. Morey),[15] and he wanted to gratify his great love for research and he did have work in progress in his private laboratory; but, in his characteristic fashion, he sacrificed personal desires to do those things he could do and others could not or were disinclined to do. We are assembled in one of the monumental evidences of this immolition.[16] He made possible the new Wolcott Gibbs Laboratory for Physical Chemistry at Harvard. In the *Proceedings* of the American Chemical Society for 1910[17] he published a beautiful obituary of Gibbs, affectionately respectful, rich in reminiscence and earnest in diction. In this hall we have an evidence of his affection for the master. He visited the South American countries in behalf of the recent International Congress of Applied Chemistry. He worked long and hard on important committees in connection with the congress. These were some of the "*other things*" he found to do for chemistry.

[14] SCIENCE, 30, 664.

[15] *Jour. Am. Chem. Soc.*, 32, 652. During 1909–10 Dr. Loeb abstracted the Italian journals for *Chemical Abstracts*.

[16] See Loeb's address at the opening of the Chemists' Club in *Met. and Chem. Eng.*, 9, 177 (1911).

[17] Pp. 69–75.

The shock of Morris Loeb's death still oppresses us; but I am convinced that, as time passes and as we reach a juster evaluation of events, we shall become more and more sensitive of what this man's life really meant, and learn from it what our profession really means. He sought no office; he sought only opportunities to serve his fellowmen. He did it all with a sweet dignity that spells humility. For

Not in hewn stones, nor in well-fashioned beams,
Not in the noblest of all the builder's dreams;
But in the courageous man of purpose great,
There is the fortress, there is the living state.

CHARLES BASKERVILLE

October 11, 1912

THE GEOLOGICAL SOCIETY OF AMERICA

BY invitation of the president of Yale University and the members of its geological faculty and other fellows residing in the vicinity, the twenty-fifth annual meeting of the Geological Society of America will be held in New Haven, Conn., on December 28–31, 1912. The first council meeting is to be held Friday evening, December 27, and the others will be called directly after instead of before the morning sessions as heretofore. Thus the council meetings will cease to interfere with the prompt beginning of the business sessions. The sessions of the society will be held in one of the recitation buildings of Yale University, and the accommodations are so ample that the council is going to try some modifications of the usual program, in an effort to enhance the interest and value of the meeting. The hearty cooperation of the fellowship is needed, however, to make the experiment a success. The morning sessions are to be devoted to papers that promise to be of general interest; the noon recess will be longer than heretofore, in order to give more time for social intercourse, group discussions and the examination of special exhibits; the afternoon sessions will be somewhat shorter than formerly and will be given over to sectional meetings and to papers of less general scope. A special room (or more than one, if needed) will be provided for the display of specimens, the hanging of charts not needed